Ursinus College
FY 2006-2007 Greenhouse Gas Inventory Report

Prepared for Submission to the ACUPCC

by

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Introduction

We have finally reached an era in which people all across the United States, from all different social and political classes are recognizing the very potent threats of global climate change. Greenhouse gases are increasing in concentration from industry, transportation, and other related carbon intensive operations. Additionally, more people are becoming aware of the imminent consequences if we chose to take no action. Simple recognition, however, is only a small first step towards confronting and finding solutions to global climate change. College and university campuses are surpassing the stagnant stage of recognition and reaching into the realm of confrontation, solutions, and action. For proof, the President's Climate Commitment (PCC) is a commitment to develop a plan to ultimately achieve carbon neutrality and curb the effects of global climate change. Ursinus College's president, John Strassburger, is one of the 518 signatories, initiating the pavement of Ursinus' path towards the goal of achieving carbon neutrality. This commitment enhances our mission statement, which "encourages students to think for themselves, so that they may become mature, responsible independent adults in an interdependent world".

From an ethical standpoint, it is the responsibility of every individual to confront climate change in a mature and action-oriented manner. And President Strassburger calls on every member of the Ursinus community to first recognize and then confront the challenge of global climate change by working towards carbon neutrality as both individuals and a community.

The first step towards confronting this issue has already begun on the Ursinus campus through the completion of a greenhouse gas inventory. The inventory assists in quantifying and monitoring greenhouse gas emissions from everyday campus operations and activities as well as offsets, or removal, of carbon through sequestration. The inventory is an important aid in identifying trends in emissions and provides a foundation for establishing a plan to reduce these emissions over time.

Reducing and eventually erasing these emissions is the goal of the Ursinus community and by doing this, we can become a role model in the community at large. College campuses have a high population in a relatively small area and consequently, a high concentration of greenhouse gas emissions. Therefore, by achieving carbon neutrality, Ursinus as well as other colleges who have committed to the PCC can greatly reduce overall greenhouse gas emissions across the nation.

Goals

The objective of this report is to ensure that the Presidents Climate Commitment remains at the forefront of Ursinus College's decision making processes now and in the future. It should serve as a guide to support and facilitate the creation of a plan to reach carbon neutrality by a reasonable date. In addition to indicating the deadline for carbon neutrality, it should establish a timeline that will delineate specific actions to steadily reduce greenhouse gas emissions.

The greenhouse gas inventory was completed by the students in the 2008 Environmental Studies Senior Seminar. Their goal was to quantify the carbon footprint of Ursinus College and to

describe it in a way that is meaningful to the entire campus community. Every member of the Ursinus College community should be aware of the impact they are exerting and the overall impact the College has on the environment. It is critical that the results of the inventory emphasize the direct connection between daily college operations, student, faculty, and staff behavior, and greenhouse gas emissions.

Methods

Clean Air Cool Planet's Greenhouse Gas Inventory Calculator was used to calculate Ursinus College's carbon footprint. The calculator is one of several created for the purpose of developing a strategic plan to reduce greenhouse gas emissions with the ultimate goal of achieving carbon neutrality (see http://www.cleanair-coolplanet.org/ for more information).

To determine an institution's carbon footprint, the calculator demands past (dating back to 1990 if possible, in order to track trends) and present data pertaining to institutional demographics, purchased electricity, on campus stationary sources of emissions, transportation, agriculture, solid waste, refrigeration/chemicals, and emissions offsets. There were several areas of potential emissions, including an on campus co-generation plant, incinerated waste, coal, and animal agriculture, that do not apply to the operations of Ursinus College and were therefore excluded from the inventory. Data tracking and gathering was split between seven students in the senior seminar – with three people working alone, and four people working in pairs. The bulk of the data was accessible from Facilities Services and Ursinus contractees such as J.P. Mascaro. A majority of the data was attainable via communications with various campus organizations such as admissions, the registrar, the study abroad office, and the business office. While data was not always available from as far back as 1990, the most pertinent data was available for current and recent academic years.

It is important to acknowledge that while the CACP carbon calculator covers most major aspects of greenhouse gas emissions, it falls short in some areas. For example, there is no section that takes into account the emissions associated with transporting food and food supplies to Ursinus for dining. However, despite its imperfections, the calculator is a critical first step towards developing plans for emissions reduction and eventual carbon neutrality.

Transportation

Transportation at Ursinus College includes every gas burning vehicle owned by any member of the Ursinus Community; including the college itself. The greenhouse gas calculator divides transportation into three categories: (1) student transportation, (2) faculty and staff transportation and (3) facilities transportation. The nature of the data was troublesome at certain points during collection as a lot of the information the calculator wanted was simply not kept or unavailable, leading us to have a final product of both specific and accurate data as well as close estimations to fill in the necessary knowledge gaps.

For students the main focus is personal cars, along with some public transportation. Car use was the biggest contributor to greenhouse gases with a cumulative estimate of students driving between 480,000 – 500,000 miles per school year.

For faculty and staff, the main focuses are personal cars, carpooling, public transportation, travel to national and international conferences and travel for research. The biggest contributor for faculty and staff was cars as well; they averaged between 560,000 and 600,000 miles per school year.

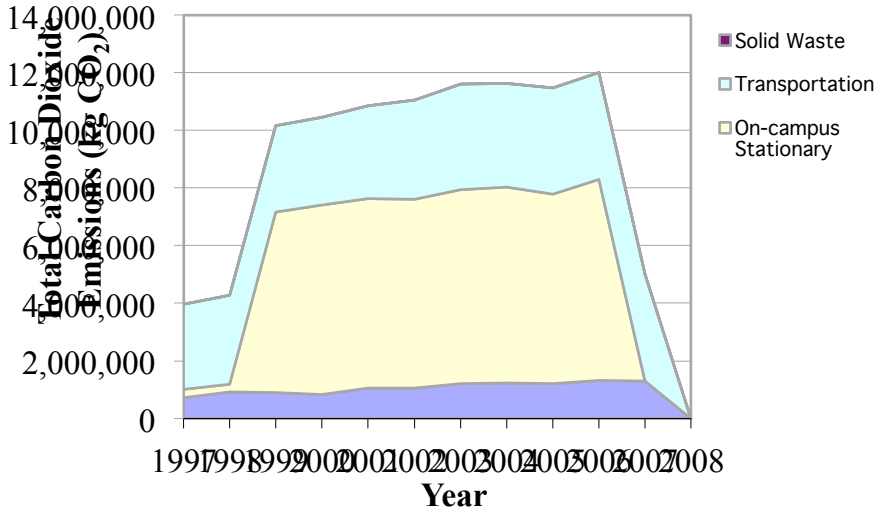
For facilities the focuses are the campus fleet, on-campus construction, waste removal, transportation associated with athletics, and assorted grounds maintenance. The most accessible data was everything available in facilities pertaining to the campus fleet. This includes safety cars, the SERV car, science trucks and vans, college vans, and golf carts.

Between 2006 and 2007 Ursinus College released just over 13,000 tons of eCO_2 into the atmosphere from transportation alone. Similar numbers were the case in previous years as well. On the plus side, Ursinus just canceled its diesel contract and moved completely to biodiesel. This is a small step in the right direction. The future of transportation at Ursinus will have to be drastically different to reach carbon neutrality.

Purchased Electricity

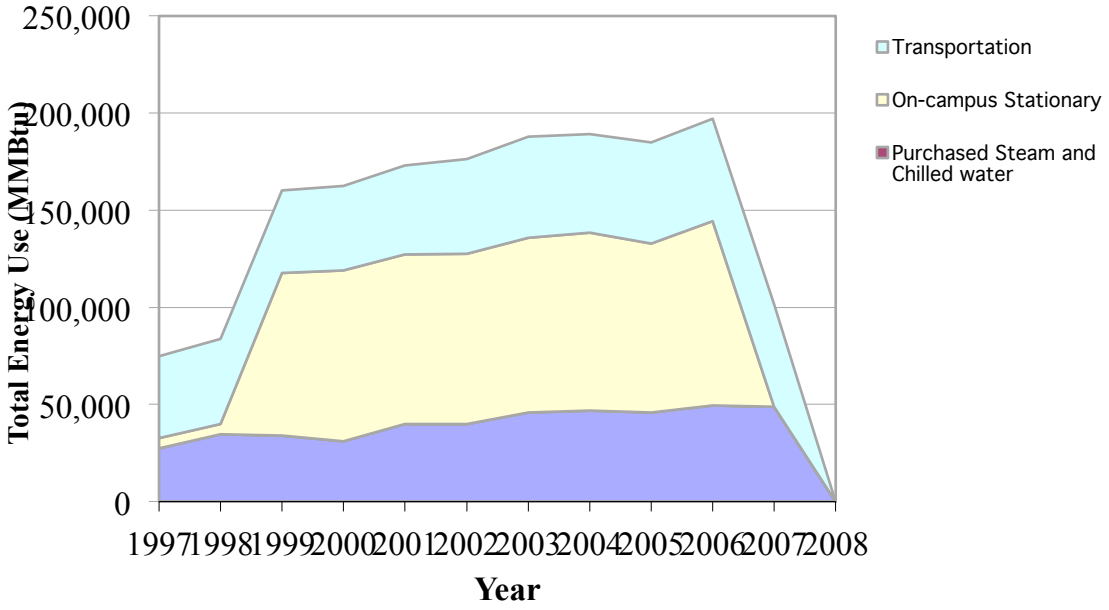
Ursinus purchases its electricity from Exelon Corporation. Eighty percent of its electricity is nuclear, 10% percent is coal-generated, 5% is hydroelectric, and 5% is generated by wind and landfill gases. Nuclear power plants do not generate greenhouse gases, although their waste is extremely hazardous. This explains why electricity does not account for a large majority of Ursinus' carbon dioxide emissions. Coal is the only sector of the College's purchased electricity that is a significant source of carbon emissions. Electricity thus accounts for 11% of the school's carbon emissions - the remaining emissions being generated by transportation and heating/cooling. Finally, while nuclear power does not stand in the way of carbon neutrality, it is an aspect of Ursinus College operations that should be analyzed carefully in the face of environmental sustainability and human health.

Total Carbon Dioxide emissions by sector (kg CO_2)



Purchased electricity is responsible for approximately 25% of Ursinus College's total energy use – transportation accounts for 27% and on-campus stationary sources account for 48%.

Total energy use by sector
(MMBtu)



Buildings and Grounds

The Grounds section of the calculator, as it relates specifically to Ursinus College's operations, serves to quantify the campus's yearly nitrous oxide emissions resulting from synthetic fertilizer use. Fertilizer is applied on campus gardens and athletic fields, and occasionally the urea-rich blend is used to melt ice. Fertilizer is used immediately upon delivery because the Environmental Protection Agency requires that it be reported if stored. The records for fertilizer purchases date back only to the 2004-2005 fiscal year. Each invoice in the archive states the weight of purchased fertilizer in pounds and its percentage of nitrogen. During the 2004-2005 fiscal year, 8,475 pounds of fertilizer were applied to the grounds, composed of approximately 22% nitrogen. During the most recent fiscal year of complete data, 2006-2007, Facilities applied 13,800 pounds of fertilizer, containing similar nitrogen concentrations as the 2004-2005 period. The use of composted food waste from Wismer, a plan that is currently in development, would reduce the college's reliance on synthetic fertilizer.

Waste & Recycling

General, non-recyclable waste removal on campus is contracted to J.P. Mascaro. Non-recycled waste consists of (but is not limited to) plastics #3-8 (including most food packaging at

Zack's), electronics, furniture, carpets, paperboard, books, clothing, and food. That waste is stored in a landfill that collects methane for electric generation.

Since 1998, Mascaro has been removing an average of 900 tons of waste per year from various open top dumpsters. Solid waste is responsible for approximately 13500 tons of eCO2 All of the methane emissions 7.4 tons, are due to solid waste. However, solid waste did not contribute to nitrogen oxide emissions at all.

Waste generated from building and construction on campus was removed by Warfel Construction Co., and disposed of by RBS Enterprises. However, they were unable to provide tonnage of the waste removed, or how the waste was disposed of. A source from Warfel referenced the United States Green Building council's estimate of 2-2.5 pounds of solid waste per square foot of building space. However, sources from both Warfel as well as RBS Enterprises noted that most of this waste is recycled. In addition to most solid waste from buildings and construction being recycled, approximately 20% of the waste currently generated on campus is recycled.

Refrigerants

Refrigerant emissions occur from leakages during maintenance of refrigeration units on campus. This includes air-conditioning units, the Wismer salad bar and other Wismer refrigeration, DLH ice machine and any other older refrigeration. Refrigeration and other chemicals accountted for about 64 kg of emissions in 2007. . The refrigerants used on campus are HFC 134A, HFC 404A, HCFC 22, CFC R-12, and R-409A. The Montreal Protocol and the Clean Air Act have required the phasing out of chlorofluorocarbons (CFCs) because they were found to be damaging to the ozone layer. Unfortunately, its alternatives, which include hydrofluorocarbons (HFCs), were also found to be a hazard.

Because of the CFC phase out, the Clean Air – Cool Planet Campus Carbon Calculator does not require that CFC data be collected but allows for input since it contributes to emissions. In 2006 CFC emissions totaled 0.5 pounds and the total for all refrigerants and other chemicals totaled 20.884 kg for that year. The total for 2007 amounted to 63.983kg, with no CFC emissions. 2008 showed no emissions from any refrigerants or other chemicals as of March.

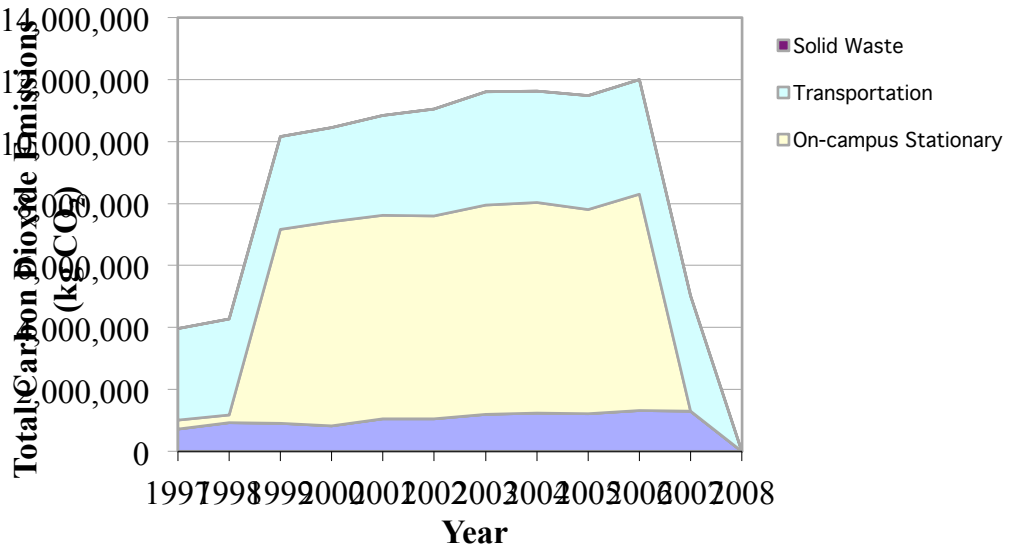
Unfortunately older data for refrigerants and other chemicals is limited due to a lost log book. However, trends can be seen in the two years of data that is available. While CFC leakages are down, others are on the rise. Options for reducing emissions from this sector is somewhat limited, however, many refrigerants are being phased out in favor of ones with a lower global warming potential (GWP). Upcoming renovations on campus will allow for the purchase of more energy efficient refrigeration systems. Ensuring proper service of the unit is also critical. Certain techniques can be implemented or improved upon during maintenance to assure that leakage is at a minimum.

Heating & Cooling (includes oil, natural gas, and propane)

On-campus stationary sources of energy (i.e., heating and cooling via residual and distillate oil, natural gas, and propane) are responsible for the majority of carbon dioxide

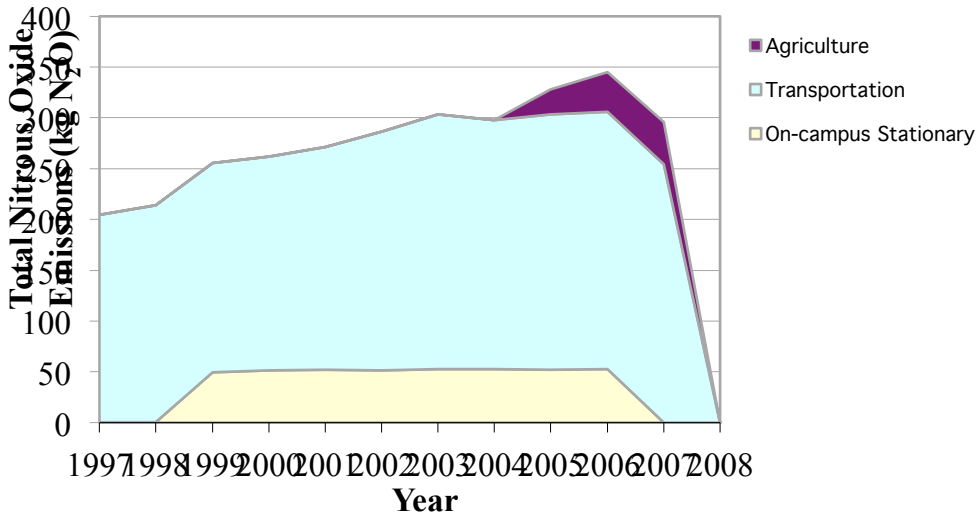
emissions – 58%, while transportation accounts for 31% and purchased electricity accounts for 11%.

Total Carbon Dioxide emissions by sector (kg CO_2)



In addition, heating and cooling is the only source of nitrogen oxide (N_20) at Ursinus College other than transportation. In 2006, heating and cooling accounted for 17% of the emissions, while transportation accounted for 83%.

Total Nitrous Oxide emissions by sector (kg N_2O)



Analysis & Recommendations

Global climate change is the most pressing environmental issue the world is faced with today. Through Ursinus College's Carbon Neutrality project, the Ursinus community will become educated in ways to reduce greenhouse gas emissions on campus and in their everyday lives. Success will require collaboration by and dedication of faculty, students, and staff. Success is dependent upon changes that will affect everything from student life to the administration. A campus-wide shift to a paradigm of sustainability is a one of the pillars necessary for a complete comprehensive change.

Adopting the President's Climate Commitment has given Ursinus the opportunity to identify ways it can provide leadership in sustainability. When President Strassburger signed the PCC, the college agreed to make its best effort to become carbon neutral. However, it is our moral imperative as members of the Ursinus community to make it the best it can be: that is nothing less than educating the community about the challenges of sustainability and emulating that knowledge by being a sustainable institution.

This report has been prepared for a steering committee on carbon neutrality at Ursinus College. Cooperation between students, staff, and faculty will be necessary to achieve the goals of the project. Since global climate change affects everyone, broad support will be necessary. Some ways to incorporate sustainable ideology is through student achievement in many ways: projects, competitions, classes, sustainable conferences, scholarships, administrative supported incentives as well as the appointment of a sustainability coordinator of campus.

A lot of projects already exist at Ursinus such as a recycling program (implemented by the student group Sustain UC, working with faculty in ENV and the Facilities Services Department), the Ursinus Organic Garden Project, PhillyCar share, and Environmental Roundtable meetings discussing issues with Senators or governmental elected officials. Ideas for future projects between students, faculty, and staff might include (1) ticketing cars that are driven by students from Main Street to any point on campus, (2) bike share programs, (3) shuttles to and from popular off campus destinations, (4) car registration restricted to upper classmen with limited exceptions, (5) changing our food source to a company that provides more organic and local options, (6) urging and providing incentives to professors that adopt paperless class.

Another way to promote student interest in sustainability is through competitions. For example, recognition of students who demonstrate sustainable life styles can be encouraged through various incentives. Students could participate in National Envirothons with College's across the country. Campus wide competitions could be used to promote creative and innovative approaches to sustainability. On January 26^{th,} 2008, Ursinus College was involved in the first ever Focus the Nation. Continued involvement in this conference will be instrumental in raising awareness and staying at the forefront of solving the problem of global climate change.

Changes will occur inside the class room, as well. It will be important to add to the already existing curriculum CIE. More emphasize will be place on current environmental problem solving. Since the nature of the course is introductory, it will immediately create a more aware student body which will in turn foster more sustainable ideas. More frequent seminars, book signings, and speakers should be given by leading scientists and experts on global climate change through the year. Students should be required to go on Environmental Stream clean ups or other local environmental projects in the area at least once a semester. Going above and

beyond the requirements should involve recognition by the administration of the student with a sustainability certification.

Another way to recognize students could be the awarding of a sustainability scholarship or awards during commencement to Ursinus students who exemplify what it means to be sustainable both socially and academically.

Perhaps the most influential change would be the appointment of a new faculty position titled "Sustainability Coordinator". The jobs of the coordinator would be to implement recommendations of the committee for carbon neutrality, promote and provide opportunities for student, faculty and staff to be more sustainable, oversee current functions of the institution and make the necessary changes that we need to accomplish the goals of the President's Climate Commitment.

A Comprehensive Approach

Achieving carbon neutrality is contingent upon the College taking a comprehensive, rather than piecemeal, approach. It is critical that the plan propose specific institutional changes with sustainability as the principal goal, and carbon neutrality as a component of overall sustainability. One method of accomplishing this is to consider greenhouse gas emissions reductions in all areas at once, which will ultimately increase the efficiency of planning and implementation. For instance, it could address sustainability in the College's mission statement, which already expresses that the Ursinus College community embodies leadership, values and creativity. These qualities effortlessly mesh with our commitment to carbon neutrality, but the connection could be made more explicit. The College could simultaneously investigate new sources of energy, which would minimize fossil fuels and nuclear power and would more accurately reflect the values of the College. This would also provide a new opportunity for Residence Life to engage with students, specifically in sustainability initiatives (such as energy conservation) through RA programs. Another area of concern, transportation, should be addressed in relation to related areas of emissions reductions—namely, food and food waste, construction and residence life. By identifying the relationships between sources of emissions and considering reduction strategies in a coordinated and holistic manner, the College will greatly expedite the process of planning for carbon neutrality.

In drafting the carbon neutrality plan, both immediate actions and long-term plans must be considered. Carbon-reduction strategies should be designed to be implemented in 2009 and run continuously as long as the College is operating. By underscoring sustainability as a constant theme of the College's operations, this will help establish a culture shift in the College's mission and operations toward a sustainability paradigm that will both become part of and reflect the core values of the College, while reinforcing sustainability as a societal imperative. Ursinus College will benefit in that it will thus be able to provide leadership for an array of regional and national institutions aspiring to become carbon neutral.

An effective carbon neutrality plan will not purposefully divide the College into the typical subpopulations of students, faculty and staff. Instead, it will facilitate a coordinated, cooperative effort on behalf of every member of the Ursinus population, cultivating a greater sense of community around a shared goal. To this end, a sustainability coordinator would be an

invaluable addition to the Ursinus staff. It would be this person's responsibility to inform, supervise, coordinate and mobilize the Ursinus community to promote sustainability initiatives.

The utmost challenge of writing the carbon neutrality plan will be to strive to make moral decisions, and to compromise as seldom as possible in the interests of cost effectiveness. In other words, it is imperative that decisions be made upon full consideration of ethics and science even in the face of economic challenges. Similarly, the recommended emissions reductions strategies should remain holistic, despite inclinations to deconstruct this approach for a more economic, reductionist, and piecemeal approach.